

# 10 Infrastructure Standards

As part of the work of the Climate-Safe Infrastructure Working Group (CSIWG), members compiled lists of standards, guidelines and other frameworks that guide how infrastructure in the state must be built. This compilation illustrates that there are dozens of standards, design manuals, bulletins, plans and specifications, design guidance, design criteria and references to rely on in any one infrastructure sector. This compilation begins the important task of identifying which standards are used most prevalently. The next important step will be to complete this list through a systematic survey of state engineers and architects and to identify which ones can accommodate climate change as they are currently written and which ones will need to be updated to safeguard against future climate impacts. This could be an initial action taking by the proposed standing CSIWG.

## Building Sector Standards Identified by the CSIWG

<p>New &amp; Existing Buildings, Parking Lots and Garages</p>	<ul style="list-style-type: none"> <li>• Uniform Codes: Uniform Mechanical Code (UMC), Uniform Electrical Code (UEC), Uniform Plumbing Code (UPC)</li> <li>• California Codes: T-24 Part 6 (energy and water efficiency) – 3 year cycle, T-24 Part 11 (green building standards), T-20 – appliance and equipment standards</li> <li>• ASHRAE handbook of fundamentals: mechanical design</li> <li>• State Facilities Policy: Management memos, state administrative manual, Executive Orders, legislation (some of these include LEED by reference)</li> <li>• Regulators relating to grid reliability - CAISO, CPUC, CEC (power point siting, IOU regulations)</li> <li>• LEED certification requirements for new and existing buildings</li> <li>• State Administrative Manual (SAM) chapter 1800</li> </ul>
<p>Energy Demand for Space Cooling</p>	<ul style="list-style-type: none"> <li>• Cooling Degree Days are used to estimate changes in energy demand for long-term planning (~30 years).</li> </ul>
<p>Energy Demand for Space Heating</p>	<ul style="list-style-type: none"> <li>• Heating Degree Days are used to estimate changes in energy demand for long-term planning of the energy system.</li> </ul>

## Transportation Sector Standards Identified by the CSIWG

Culvert Design	<ul style="list-style-type: none"> <li>• Caltrans Highway Design Manual (HDM) California Codes: T-24 Part 6 (energy and water efficiency) – 3 year cycle, T-24 Part 11 (green building standards), T-20 – appliance and equipment standards</li> <li>• FHWA Hydraulic Design of Highway Culverts (HDS-5)</li> <li>• FHWA Urban Drainage Design Manual (HEC-22)</li> <li>• FHWA Introduction to Highway Hydraulics (HDS-4)</li> <li>• Caltrans Standard Plans and Specifications</li> <li>• Caltrans Design Information Bulletins (DIB's)</li> </ul>
Pavement Design	<ul style="list-style-type: none"> <li>• Caltrans Highway Design Manual (HDM)</li> <li>• Design Information Bulletin (DIB) 79 Design Guides and Standards for Roadway Rehabilitation Projects</li> <li>• DIB-81 Capital Preventive Maintenance (CAPM) Guidelines</li> <li>• Caltrans Standard Plans</li> <li>• Standard Specifications</li> </ul>
Bridge Design	<ul style="list-style-type: none"> <li>• California Amendments to AASHTO LRFD Bridge Design</li> <li>• Seismic Design Specifications for Steel Bridges</li> <li>• Seismic Design Criteria</li> <li>• Bridge Design Details</li> <li>• Bridge Design Aids</li> <li>• Caltrans Highway Design Manual</li> <li>• Bridge Design Practice</li> </ul>
Signals and Signage Design	<ul style="list-style-type: none"> <li>• Overhead Sign Structure</li> <li>• Guide Caltrans Standard Plans</li> </ul>
Caltrans Buildings	<ul style="list-style-type: none"> <li>• California Building Standards Code</li> <li>• Title 24 Code of California Regulations</li> <li>• 2016 California Green Building Standards Code</li> <li>• California Energy Code</li> <li>• California Mechanical Code</li> </ul>
Safety Rest Areas	<ul style="list-style-type: none"> <li>• California Building Standards Code</li> <li>• Title 24 Code of California Regulations</li> <li>• 2016 California Green Building Standards Code</li> <li>• California Energy Code, California Mechanical Code</li> <li>• Highway Design Manual</li> <li>• Storm Water Project Planning and Design Guide</li> </ul>
Landscape Areas	<ul style="list-style-type: none"> <li>• Project Development Procedures Manual</li> <li>• Highway Design Manual</li> <li>• Storm Water Project Planning and Design Guide</li> <li>• Standard Environmental Reference</li> </ul>
Roads and Bridges	<ul style="list-style-type: none"> <li>• California Building Code</li> </ul>
Rail System and Busways	<ul style="list-style-type: none"> <li>• Metro Design Criteria, Technical Requirements, Specifications and Policies</li> </ul>
Bus and Rail Maintenance Facilities	<ul style="list-style-type: none"> <li>• Metro Design Criteria, Technical Requirements, Specifications and Policies</li> </ul>
Electrified Fleet Infrastructure	<ul style="list-style-type: none"> <li>• Metro Design Criteria, Technical Requirements, Specifications and Policies</li> </ul>
Rail Cars and Buses	<ul style="list-style-type: none"> <li>• Fleet Technical Requirements, Specifications and Policies</li> </ul>

## Water Sector Standards Identified by the CSIWG

Dams	<ul style="list-style-type: none"> <li>• California Water Code</li> <li>• ASCE journals &amp; publications</li> <li>• ASTM – American Society for Testing and Materials</li> <li>• ACI – American Concrete Institute</li> <li>• AISC – American Institute for Steel Construction</li> <li>• USACE – Engineering Manuals</li> <li>• NOAA – HMR Reports and Atlas 14 precipitation data</li> <li>• USBR Publications</li> <li>• FEMA Manuals</li> <li>• U.S. Geological Survey</li> <li>• NGA-West 2 ground motion prediction equations</li> <li>• CEQA – California Environmental Quality Act</li> <li>• Caltrans Standard Plans and Specifications</li> <li>• Uniform Building Code</li> </ul>
Pipelines/Tunnels	<ul style="list-style-type: none"> <li>• ASME B31.4</li> <li>• ASME B31.8</li> <li>• American Lifelines Alliance (seismic)</li> </ul>
Canals	<ul style="list-style-type: none"> <li>• NOAA - Precipitation Models and HMR Reports</li> <li>• HMR Reports</li> <li>• USBR - Design Standard</li> </ul>
Levees	<ul style="list-style-type: none"> <li>• USACE - Engineering Manuals</li> <li>• DWR - Levee Design Standards</li> <li>• HEC - H&amp;H Modeling</li> </ul>
Pumping/Generating Plants	<ul style="list-style-type: none"> <li>• California Building Code</li> <li>• USACE - Engineering Manuals</li> <li>• DWR - Design Standards</li> </ul>

## Energy Sector Standards Identified by the CSIWG

Electrical Transformers	<ul style="list-style-type: none"> <li>• National Electrical Manufacturers Association (NEMA)</li> </ul>
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